Guidelines for Calculating Emissions from Dairy and Poultry Operations

The dairy and poultry farms are required to report to the District their emissions of Particulate Matter (PM), Volatile Organic Compounds (VOC), and Ammonia (NH_3) that resulted from handling of livestock wastes. For poultry operations, there are also PM emissions from the feeds.

1. PROCEDURES

Facilities can estimate their VOC, PM, and NH_3 emissions using equation:

$$E = Q * EF * (1 - CE)$$

Where,

E = VOC, PM or NH_3 emissions expressed in pounds per year (lb/yr)

Q = Throughput is the number of animals per year for each animal category. For poultry farms, the throughput is also expressed in tons of birds feed when estimating the PM emissions from the bird feed.

EF = Uncontrolled emission factors from Table 1 based on the types of animals and materials.

CE = Control effectiveness listed in Table 2 based on the types of manure disposal practices.

Table 1: Uncontrolled Emission Factors

Animals/Operations	VOC, lbs/head	PM		NH_3 lbs/head
		Lb/head	Lb/ton	
Dairy Farms:				
Milking Cows	12.8	3.56	---	51
Dry Cows	8.7	3.56	---	51
Heifers (4-24 months)	6.1	3.56	---	18.7
Heifers (4-24 months)*	4.4	3.56	---	18.7
Calf (under 3 months)	4.5	3.56	---	7.5
Mature Cows*	6.3	3.56	---	51
Poultry Farms				
Manure	0.02565	0.0616	---	0.096
Feeds	---	---	0.108	---

*Emission factors for dairy operations with flush lanes that are flushed with water to a holding pond.

- *Milking cow is a cow raised to produce milk*
- *Dry cow is a cow of approximately 2 weeks from calving and in between lactation, hence, is not giving milk and is usually kept separately for different feeding.*
- *Heifer is a young female calf under 3 years old and has not borne a calf*
- *Calf is a young cow or bull in its first year*
- *Mature cow is a cow that has had one or two calves and which may be more than 3 years old.*

Table 2- Control Effectiveness

Type of Disposal	(VOC & NH_3) Control Effectiveness	(PM) Control Effectiveness
No Disposal	---	---
Best Management Practices	---	0.20
Manure Sent out of Basin	0.50	---
Composting (open window)	0.385	---
Composting (enclosed)	0.475	---
Digester (plug & complete mix)	1	---
Land Application	0.115	---

- *Best Management Practices are Class One Mitigation Measures defined in Rule 223, Appendix A, Table 1, subsections E & F, and Table 2, subsections C & D.*
- *Land Application is the use of methods such as tilling, injecting, or plowing that covers animal waste in accordance with NRCS Agricultural Waste Management Field Handbook Chapter 10, Section 651.1102.*

2. HOW TO REPORT

VOC, PM, NH_3 emissions must be reported separately for each animal category (i.e., birds, milking cows, dry cows, heifers, etc). This could be done through the following steps:

1. Determine the annual average number of animals, (Throughput, Q):
    - For a dairy farm, take the annual average number of animals for each annual category from the annual report submitted to the Santa Ana Regional Water Quality Control Board (SARWQCB).

- For a poultry farm, take the annual average number of birds using your annual recordkeeping report. In addition, the total amount of bird feed used for the same time period are also needed.

2. Select proper emission factors listed in Table 1, (EF):
   - Note that the VOC emission factors are different based on the animal category (e.g., milking cows versus dry cows) and whether the dairy farm has lanes that are flushed with water to a holding pond.
   - Note that the PM emission factors are different based on source of emissions (bird's manure or feed). There are no VOC or NH_3 emissions associated with the bird feed.
3. Select appropriate control effectiveness (CE) from Table 2 based on the type of emissions (i.e., VOC, PM, or NH_3) and manure handling method.
4. Enter the information into the AER Reporting Tool.

EXAMPLE 1:

Last year, a dairy farm facility has reported to the Santa Ana Regional Water Quality Control Board about 900 milking cows, 300 heifers (17-14 months), and no calf. The manures are sent out of the basin. This dairy does not have any lanes that are flushed with water to a pond.

STEPS TO REPORT THE EMISSIONS

Image 1: Click **Emission Sources (ES)**. The display will show existing permitted equipment/processes in the tabulated form (example, A/N 111111). Since livestock waste handling is not permitted source, it must be added to the list by clicking **Add New Emission Source** (in blue font).

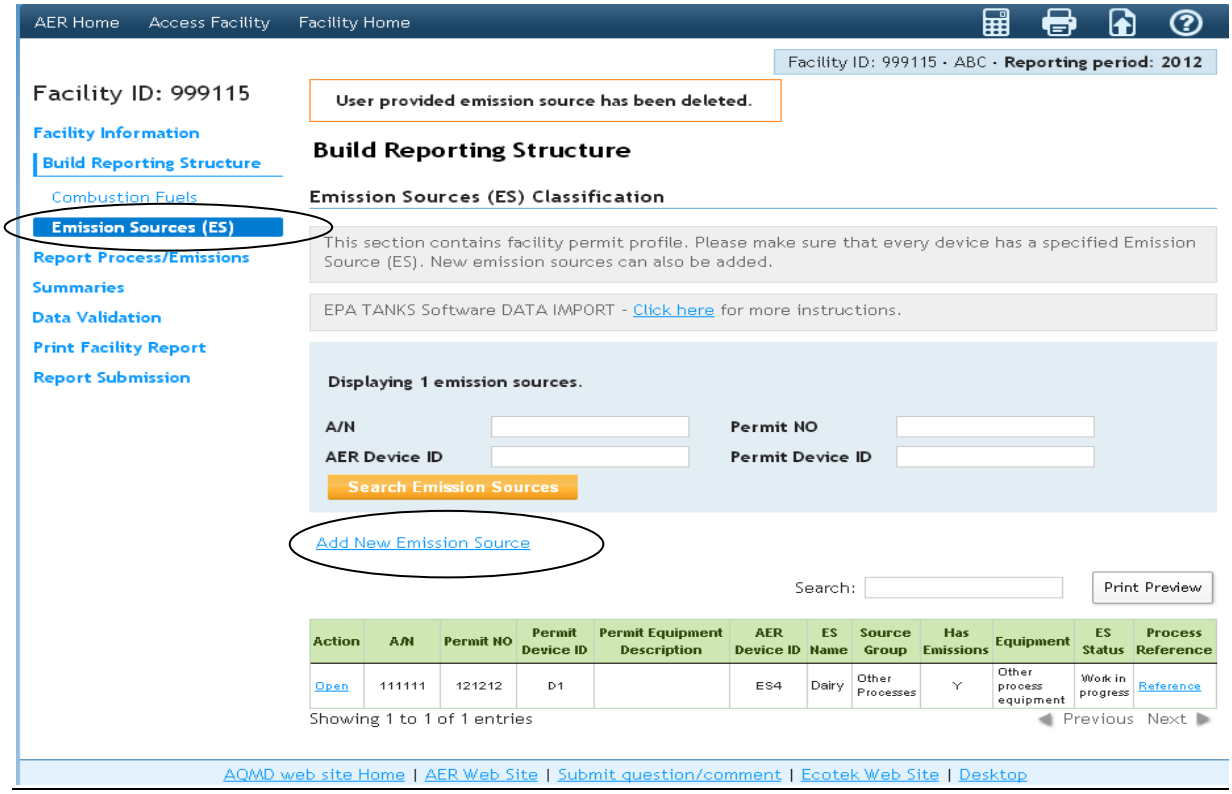


Image 2: Fill out relevant information to the added Emission Source by identifying ES Name (example, Animal Waste Handling) and selecting the Operating ES Status (i.e., Normal Operation) from drop-down menu. After selecting the appropriate Operating ES Status, the **Determine Emission Source Group Type** button will pop-out. Click this button to determine the Group for the added emission source.

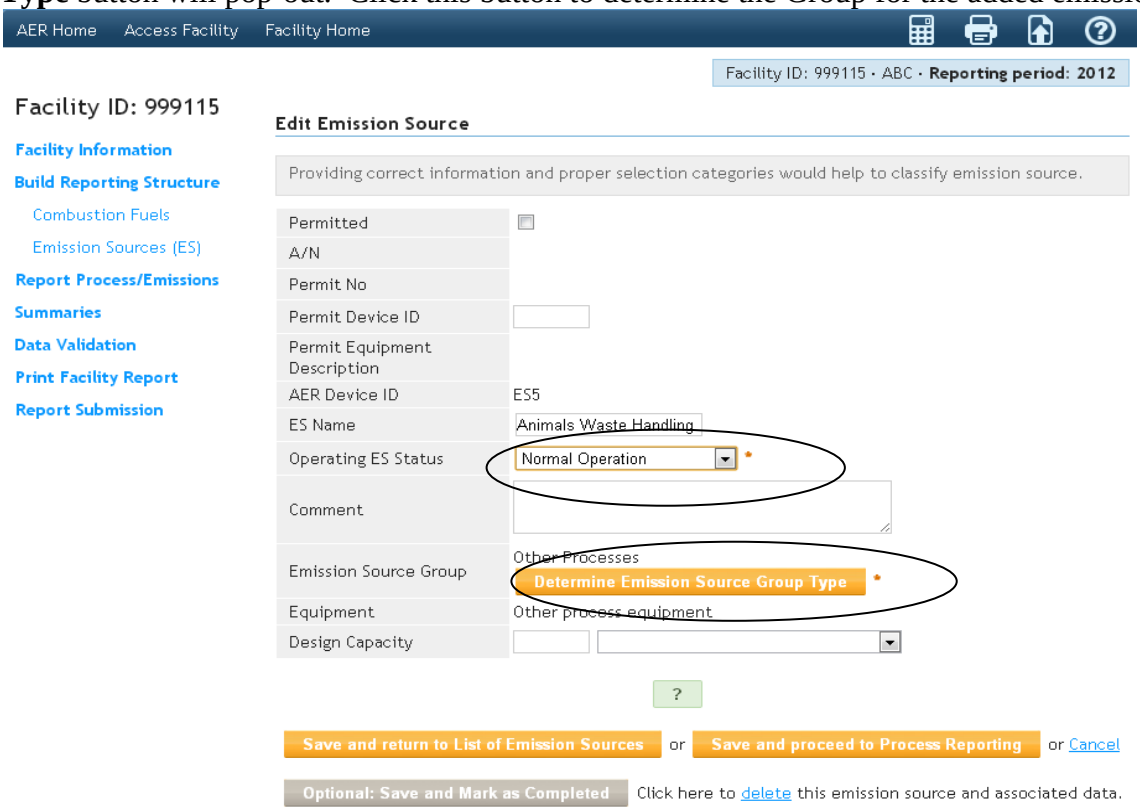
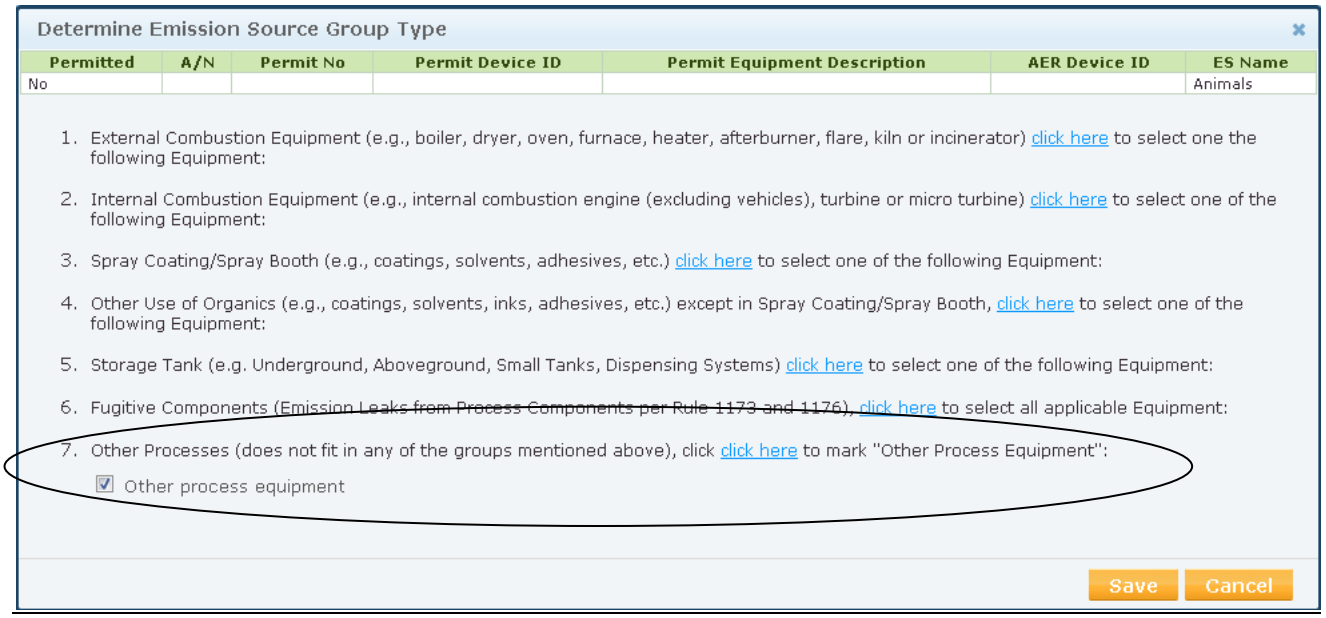


Image 3: Select No. 7 and click "**click here** (blue font)" to mark Other Process Equipment. Click the box designated as Other process equipment, and click **Save** button.



After saving, the program reverts to Image 2. Click **Save and proceed to Process Reporting** button to start reporting emissions for the added Process.

Image 4: The new Process added is shown as P1 (process 1). Click the box indicating P1 to begin entering information, such as, process throughputs, emissions and emission factors, and TACs.

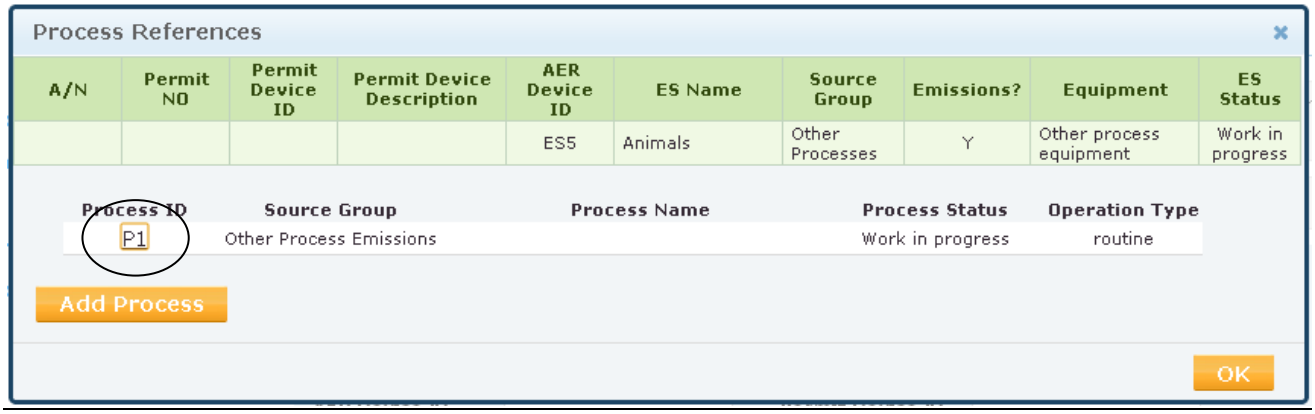


Image 5: Open the **Process** section (by clicking the blue font **Open**) to identify the Name, Activity Code, and select the appropriate Sector, Industry, Operation, Process, and applicable Rule by clicking the Drop-down arrow at the corner of each box.

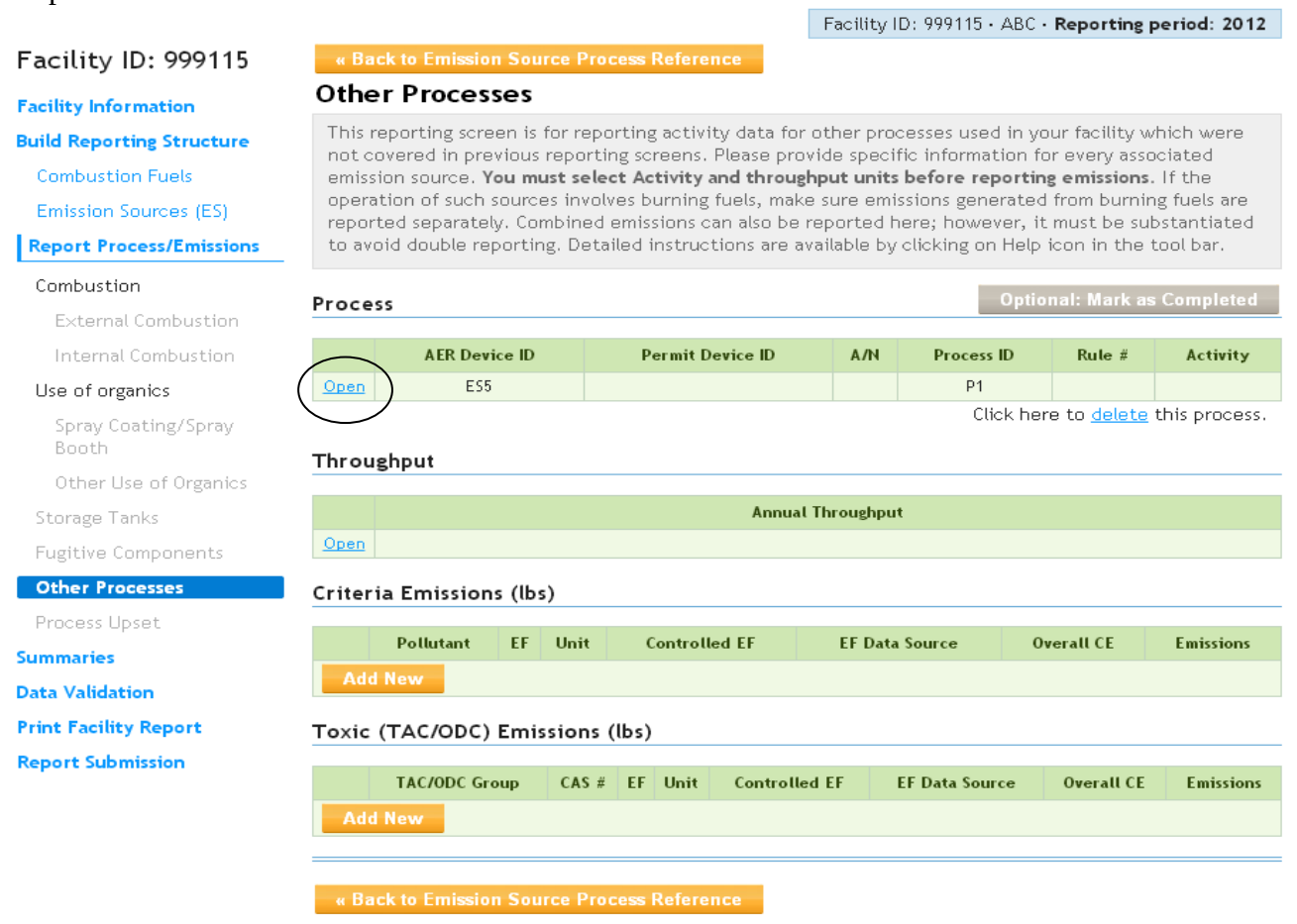


Image 6: After clicking Open, this image will pop-out. Identify the Process Name for the first process P1 and fill out the Activity Code by selecting the appropriate information from the drop-down menu from each box. Example shows correct sector, industry, operation, process, and rule for the milking cows. Click **Save** button.

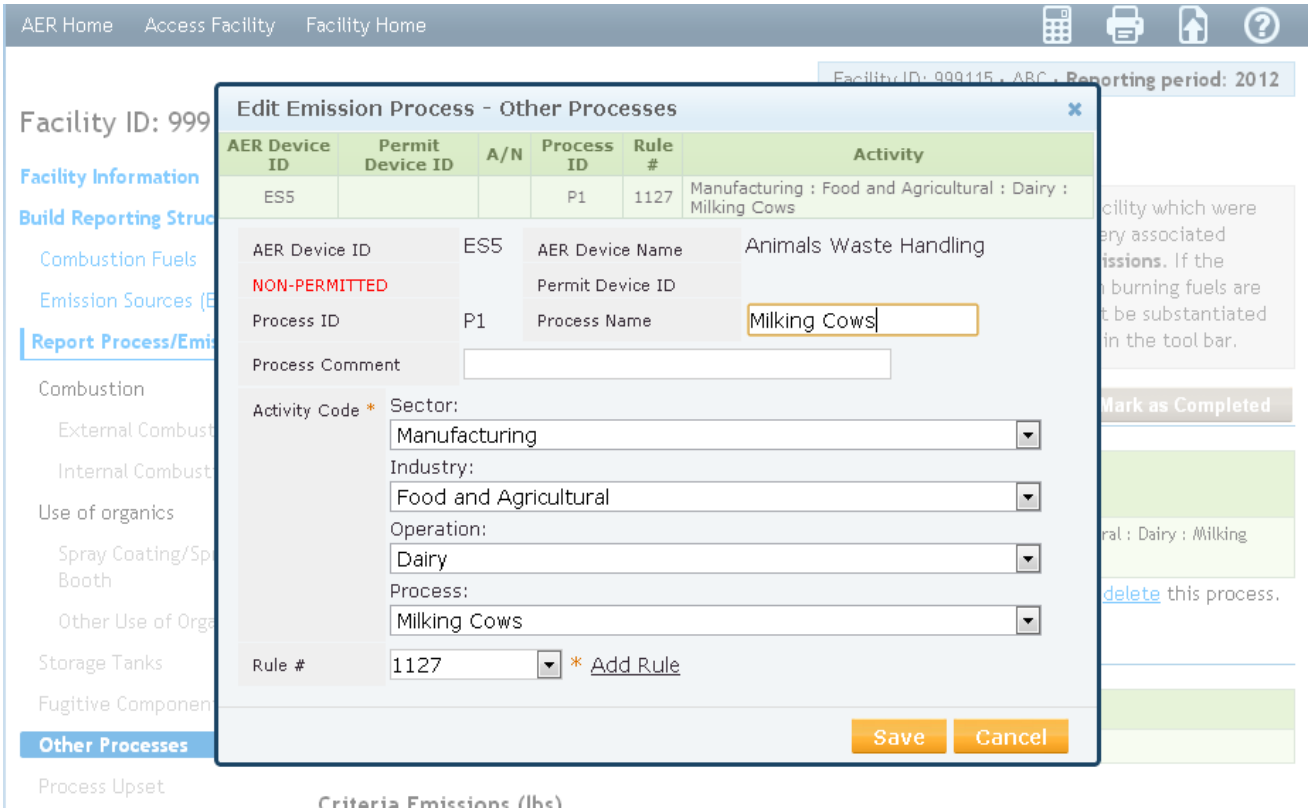


Image 7: After saved, the program returns to Image 5. This time, open the **Throughput** section (see Image 5) to enter the Annual Throughput, Type, Comment, for the Process, as shown below. Click **Save** button.

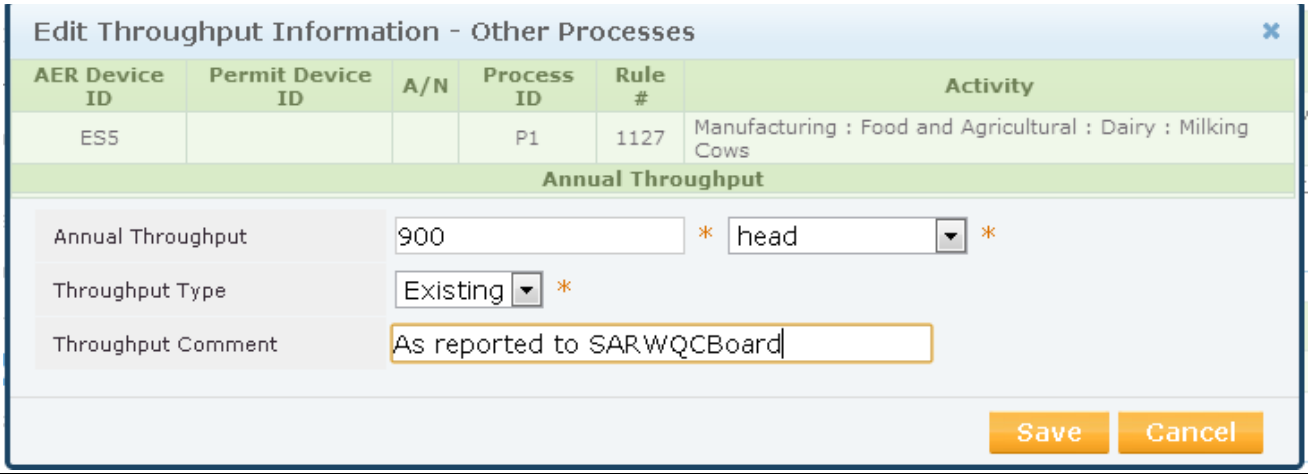


Image 8: After saving, the program returns to Image 5. Add the Criteria Emissions involved in the Process by clicking "**Add New"** (yellow button)"under **Criteria Emissions** section.

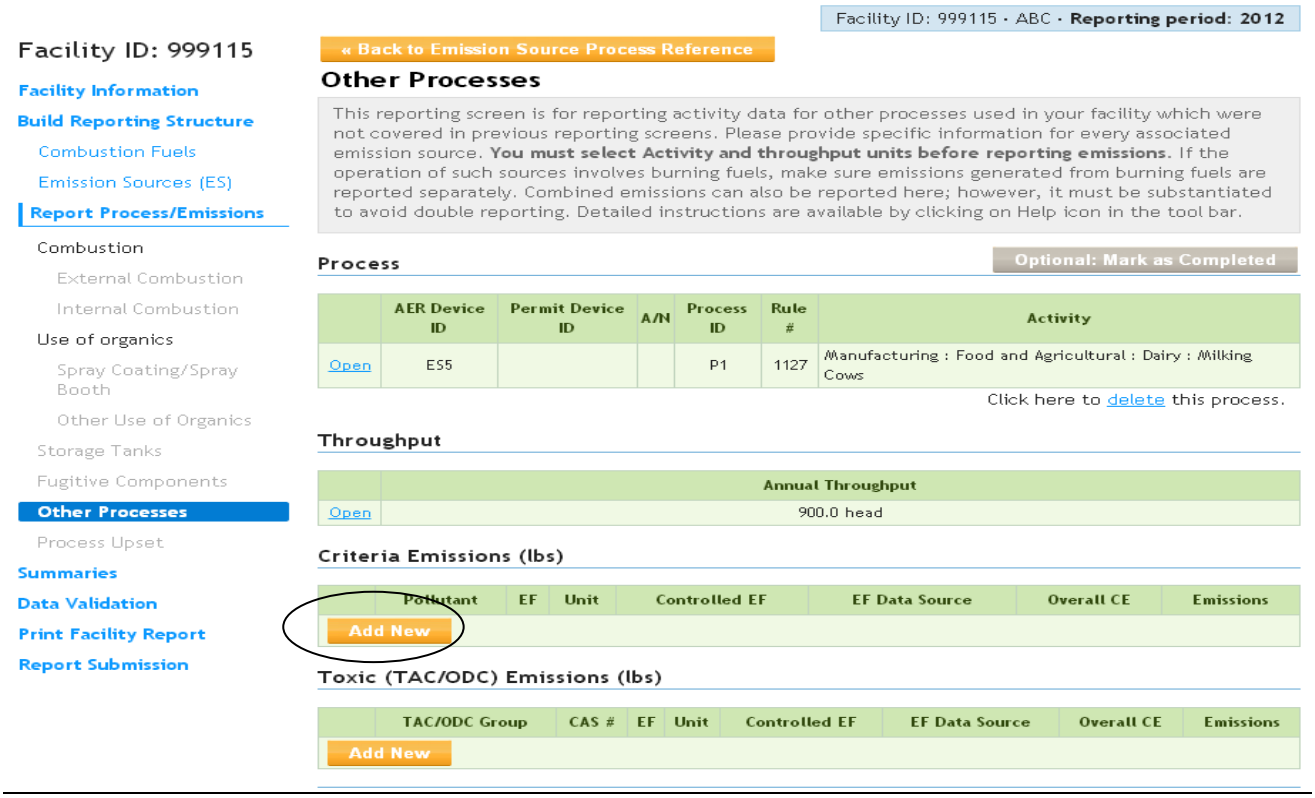


Image 9: Select the type of pollutant, (i.e., VOC, etc.) from drop-down menu, enter the applicable emission factor (from Table 1), control efficiency (from Table 2), emission factor comment and its source for the Process. Click **Save** button.

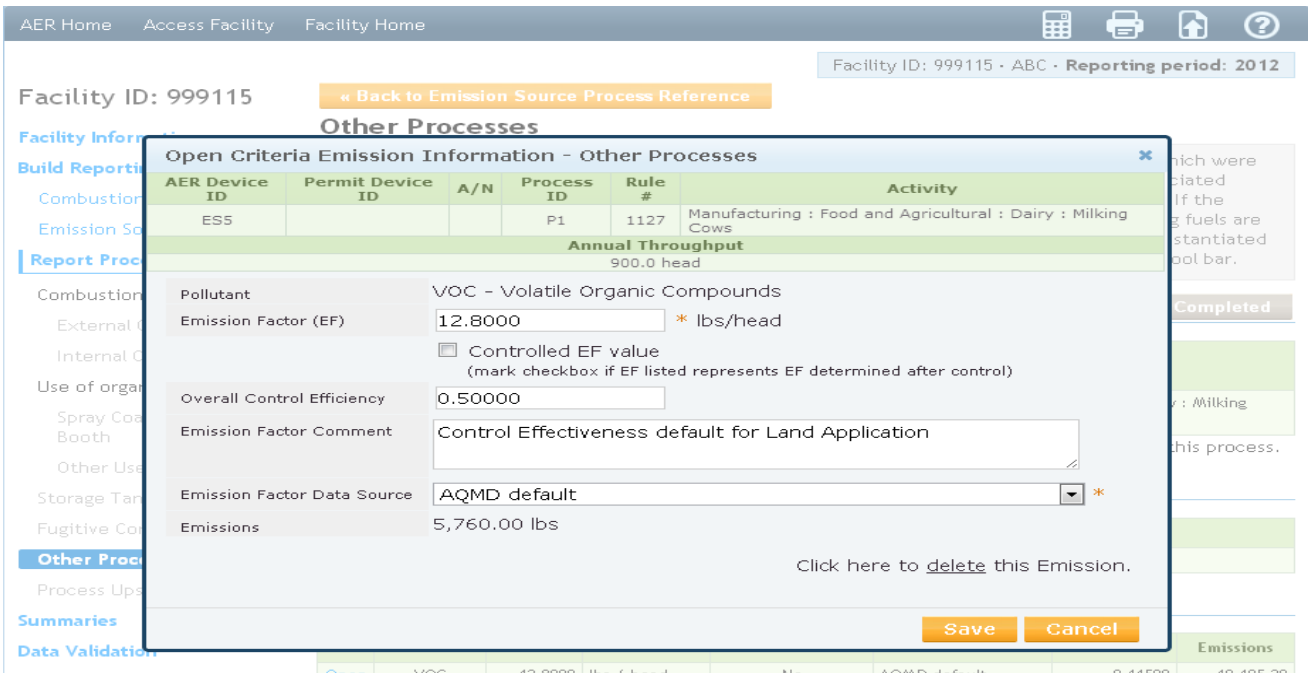
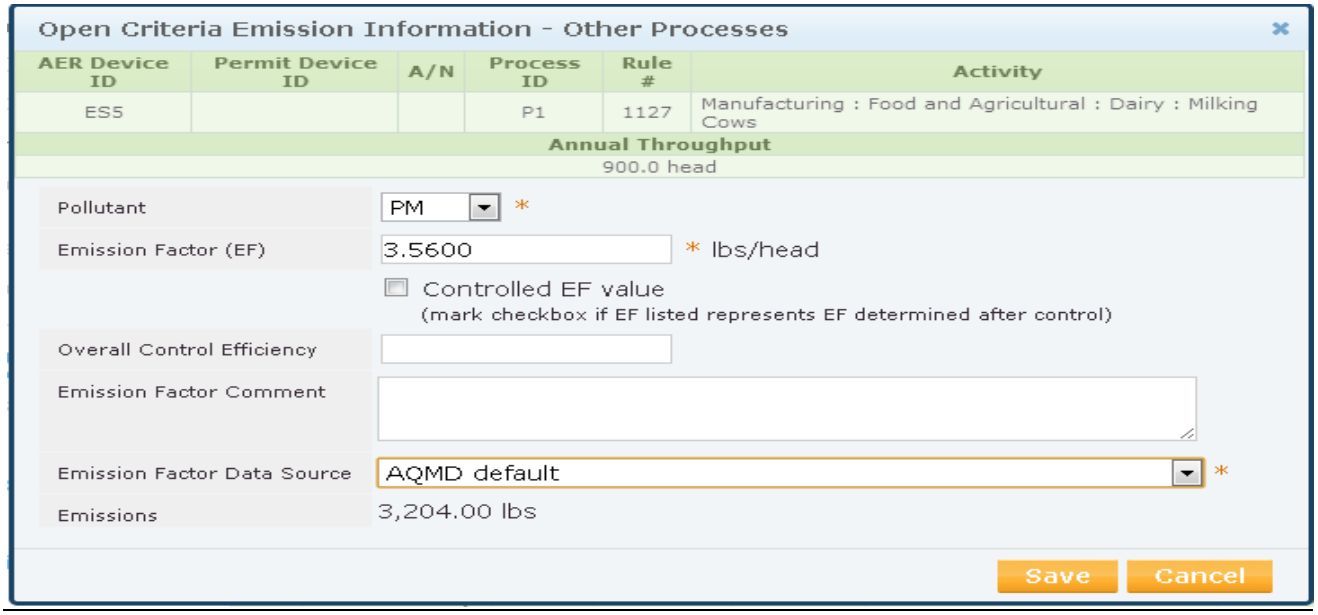
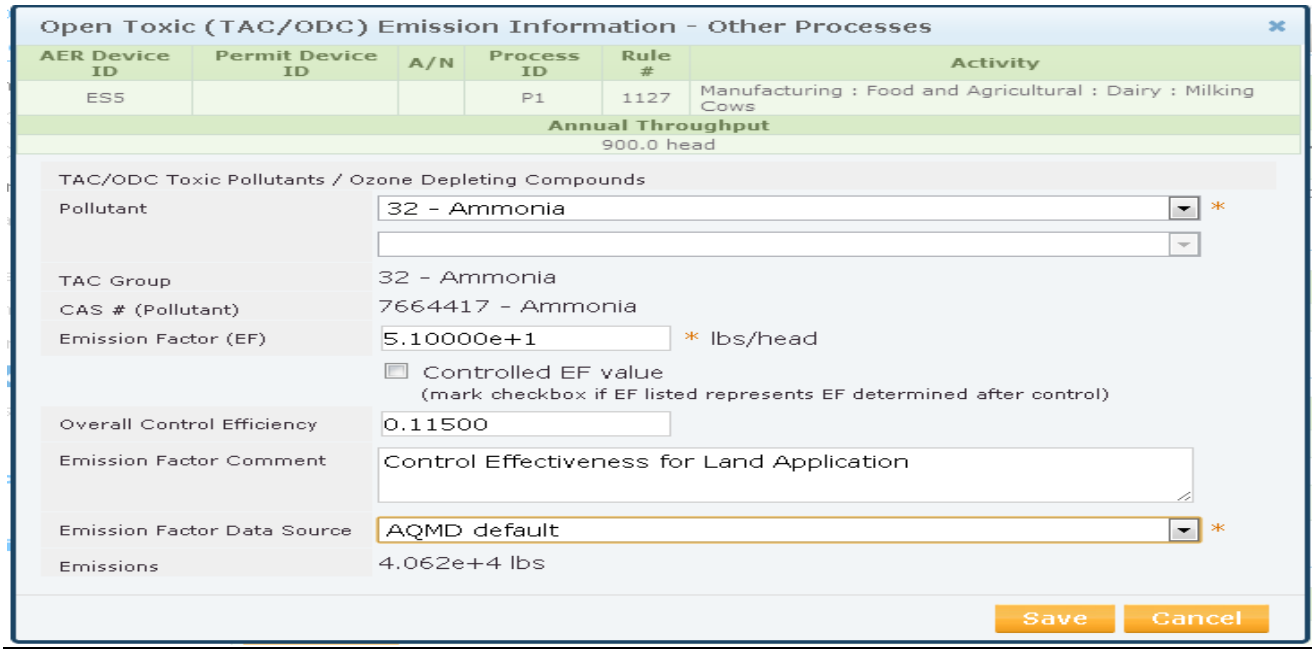


Image 10: After saved, program reverts to Image 5. To add the next pollutant PM for the same Process P1, click the **Add New** button under **Criteria Emissions** section, Select the type of pollutant, (PM) from drop-down menu, enter the applicable emission factor (from Table 1), control efficiency (from Table 2), emission factor comment and its source and enter them at appropriate boxes. Click **Save** button.



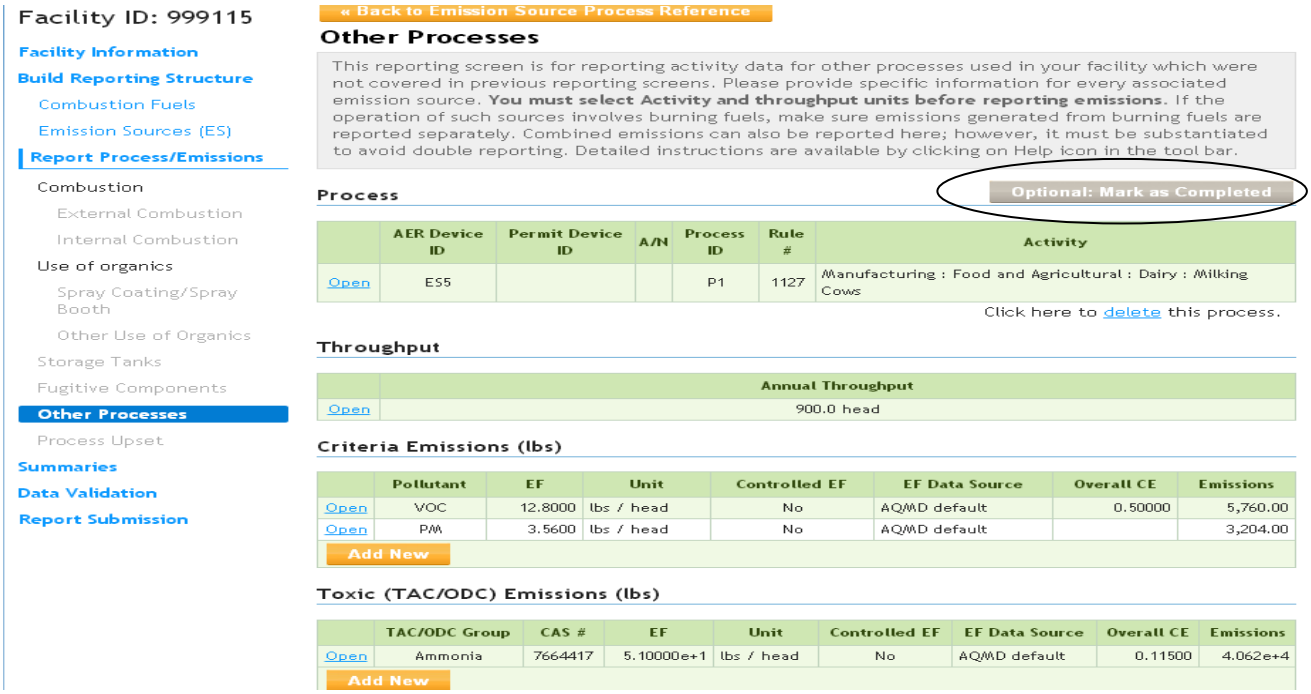
STEPS TO REPORT NH_3 (TAC/ODC)

Image 11: After saved, the program reverts to Image 5. To add TAC/ODC emissions from the same Process P1, click the **Add Toxic (TAC/ODC)** Emissions under **Toxic Emissions** section (NH_3 emissions in this example). Select NH_3 (Ammonia) from drop-down menu and select applicable Emission Factor (from Table 1) and Control Efficiency (from Table 2) and enter them at appropriate boxes. Click **Save** button.



After saved, the program reverts to Image 5. **The emissions from the 900 Milking Cows had been reported.**

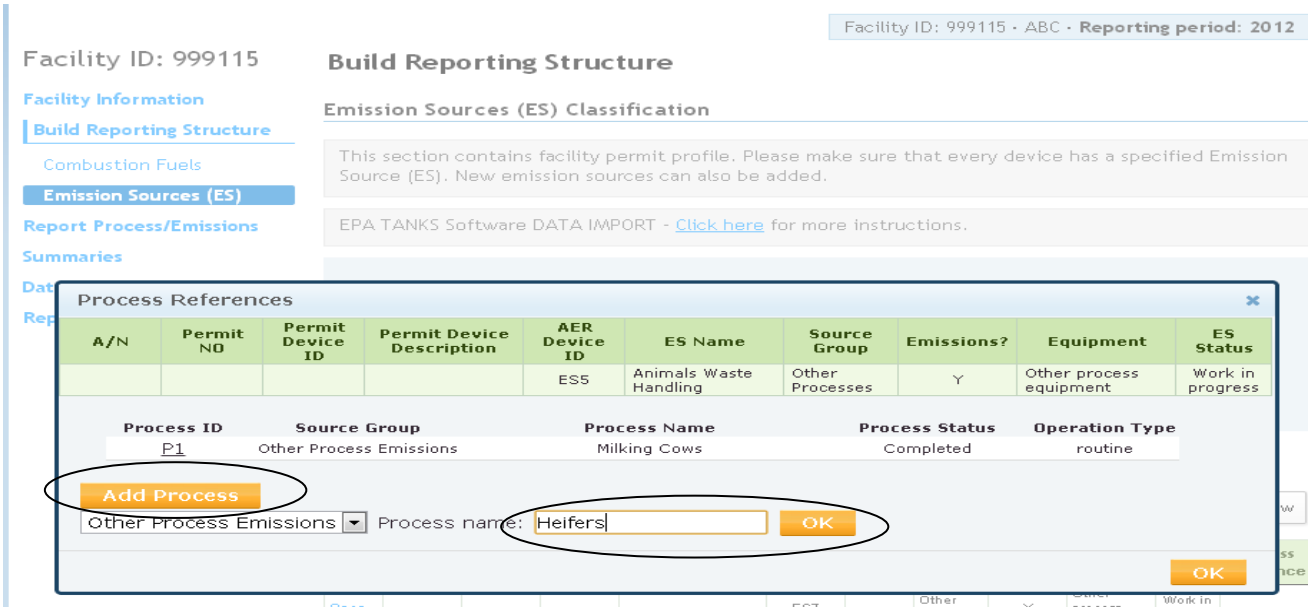
Image 12: To complete the emissions reporting for the 900 Milking Cows, click the **Optional: Mark as Complete** button (gray color), as shown below. A confirmation window will pop-out and click OK to complete reporting the emissions for the process.



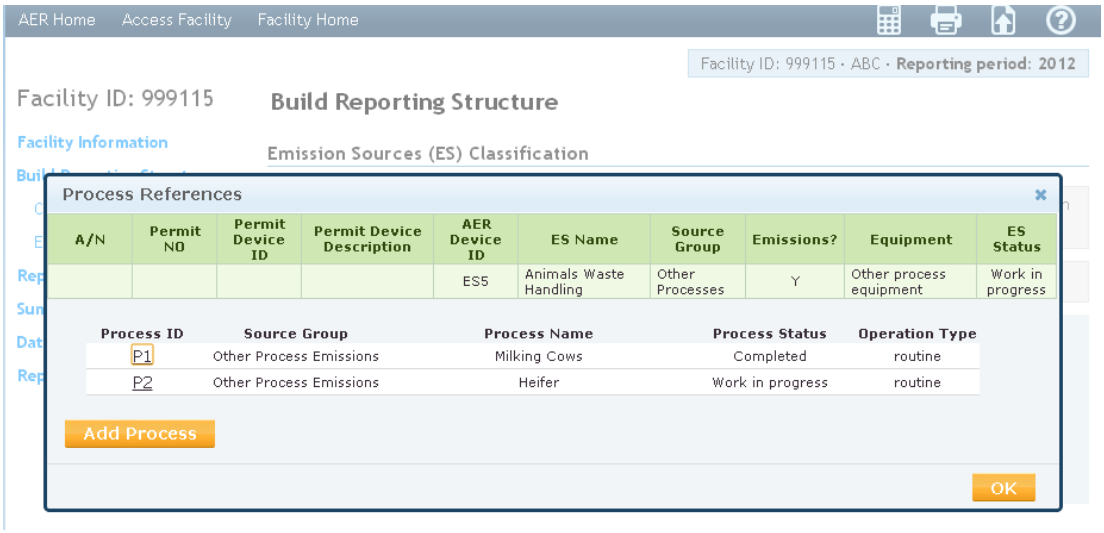
STEPS TO REPORT THE NEXT PROCESS

Image 13:

1. To add the next Process, (Heifers), click **Add Process** button as shown below.
2. Name the Process (i.e. Heifers) in the box and click OK button next to it.



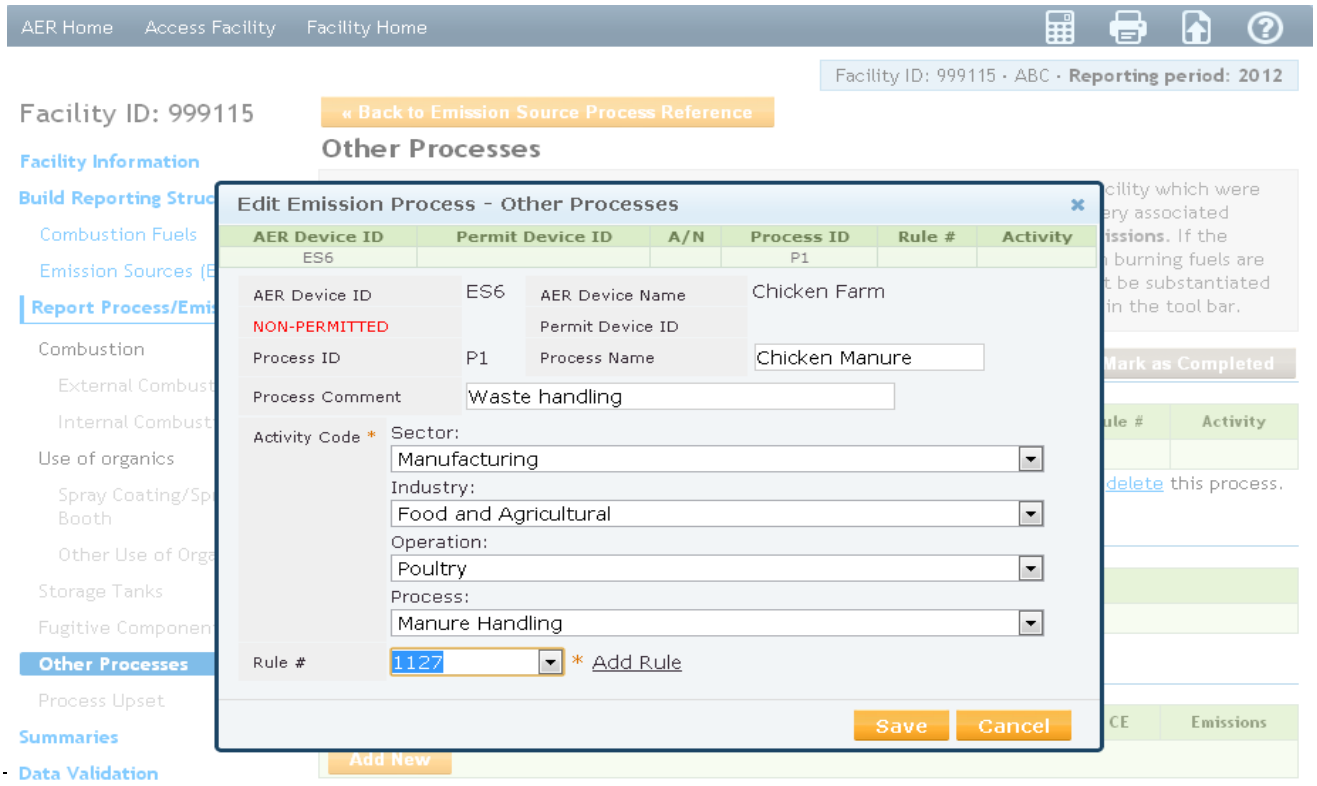
REMINDER:
To report the VOC, PM, and NH_3 emissions from the 300 Heifers, repeat the procedures as illustrated in Image 5 and follow the steps leading to Image 13.



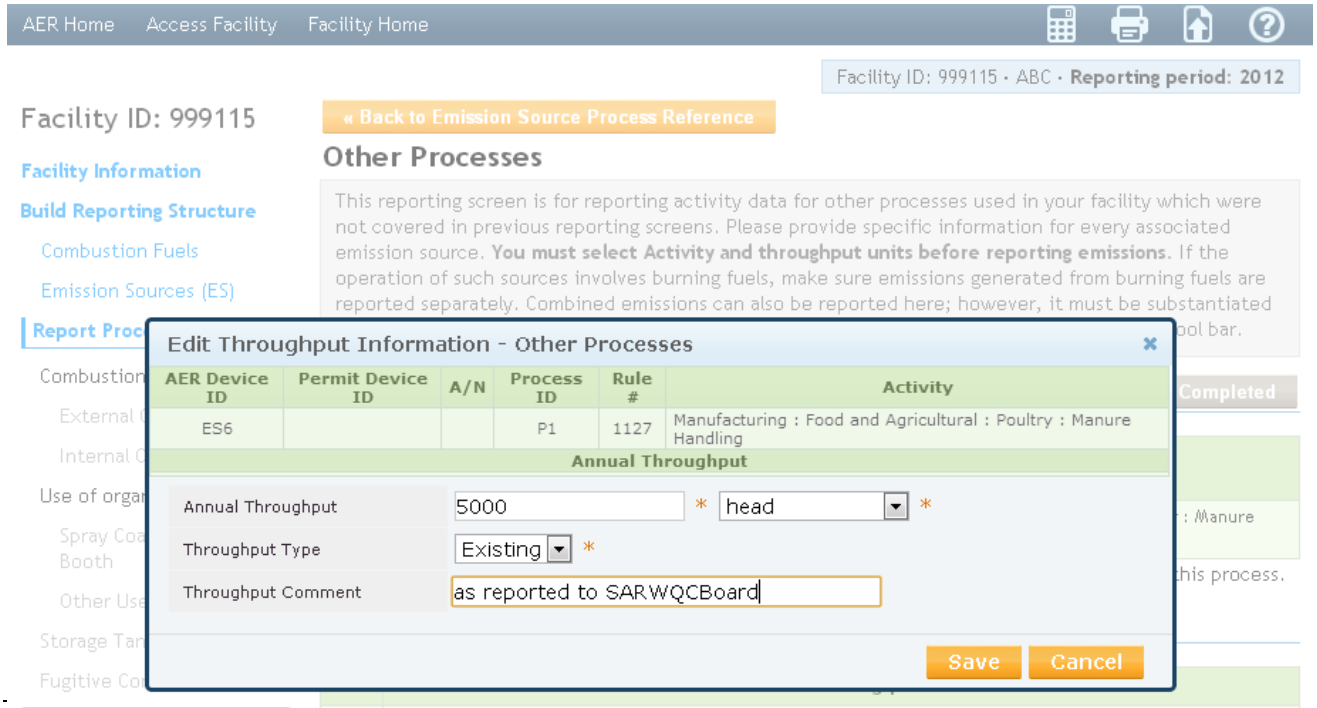
EXAMPLE 2:

Last year, a poultry farm facility has reported to the Santa Ana Regional Water Quality Control Board about 5,000 chickens and 100 tons of consumed feed. The manures are sent out of the basin. This poultry does not have any lanes that are flushed with water to a pond.

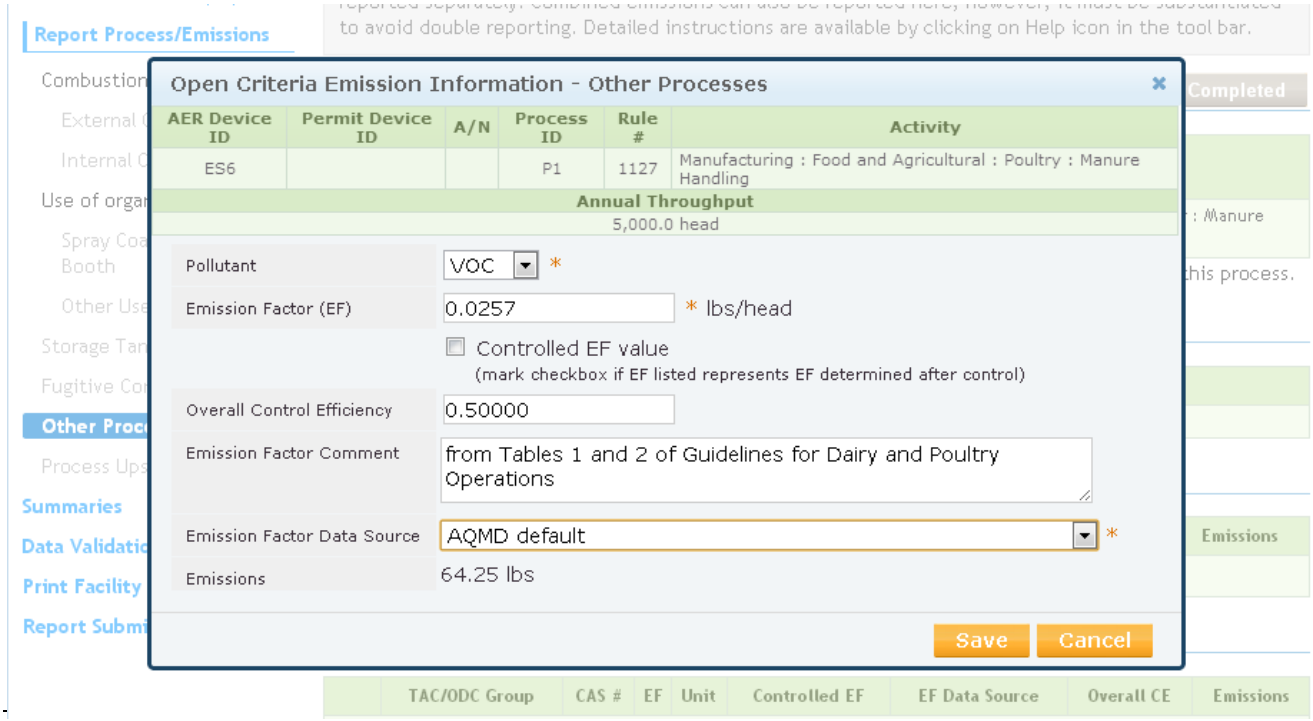
Follow procedure illustrated in Images 1-5 of Example 1 and fill in the information for Chicken Farm as shown in the following image. Click **Save** button.



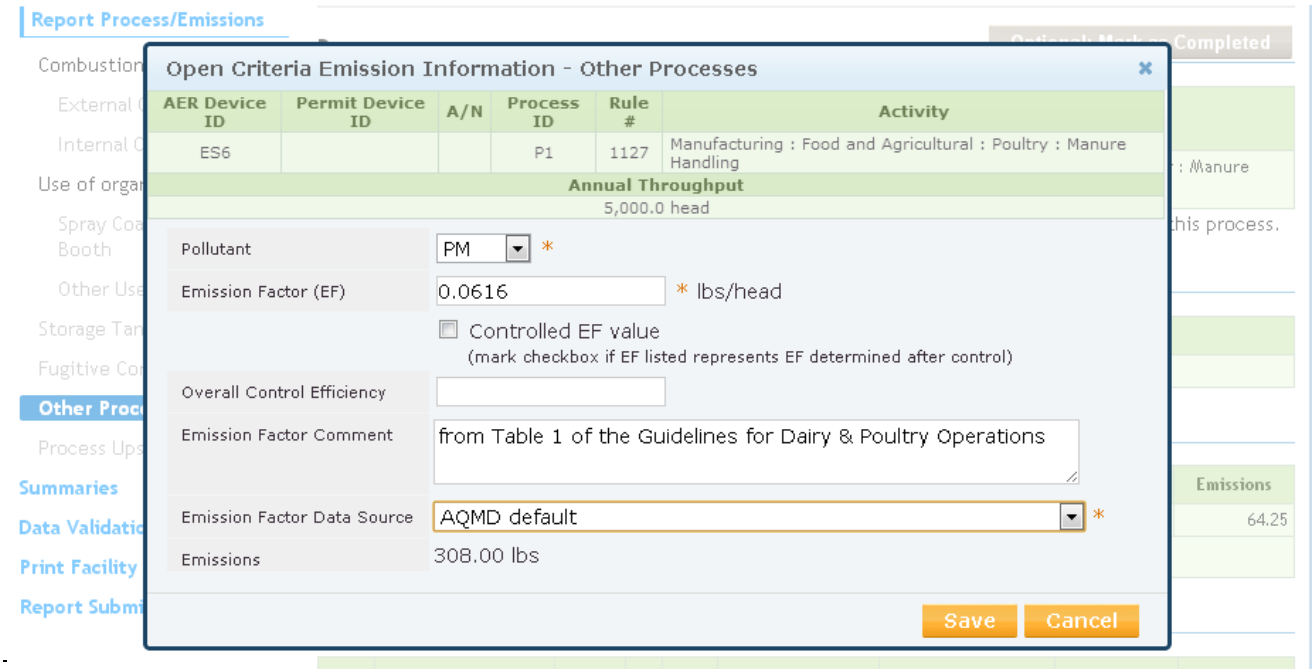
After saved, program will revert to Image 5. Open the **Throughput** section to enter the amount, as shown below. Click **Save** button.



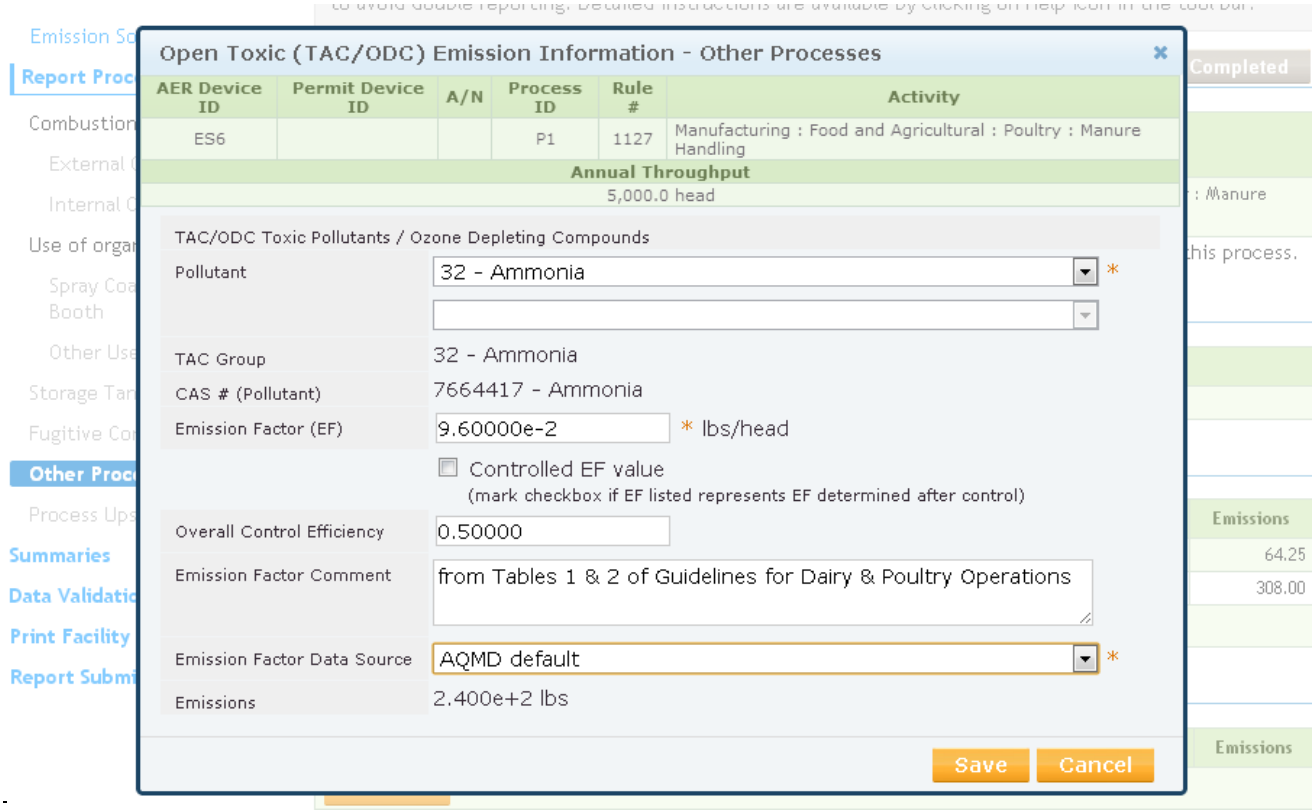
After saved, program will revert to Image 5. Open the **Criteria Emissions** section (by clicking **Add New**) to enter the criteria pollutant (i.e., VOC) and its emission factor information, as shown below. Click **Save** button.



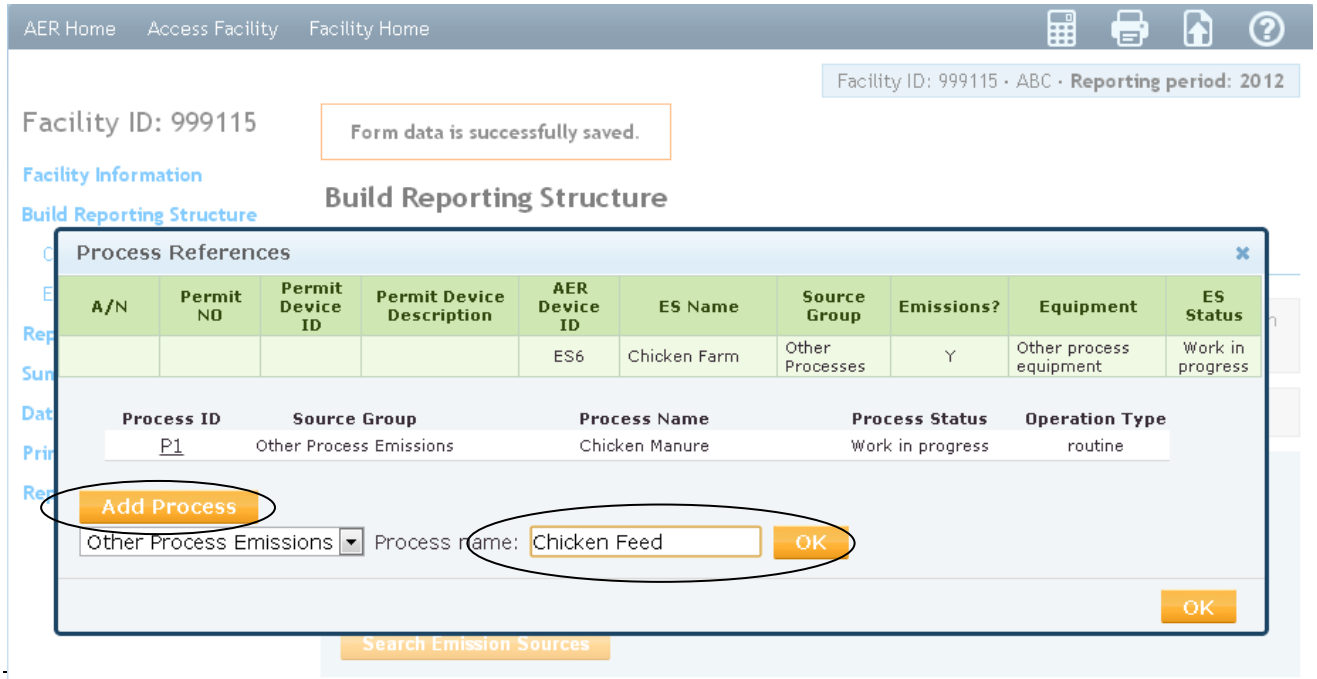
After saved, program will revert to Image 5. Open the **Criteria Emissions** section again by clicking **Add New** to enter the next criteria pollutant (i.e. PM) and its emission factor information, as shown below. Click **Save** button.



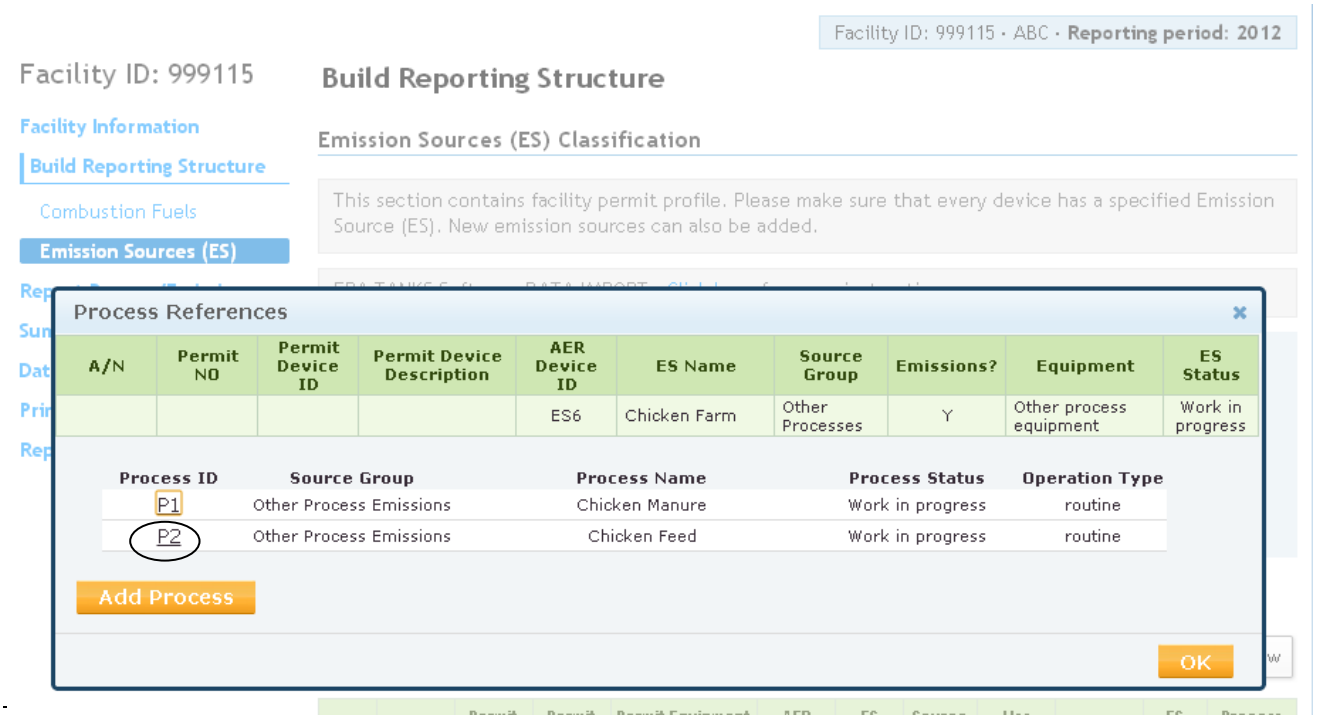
After saved, program will revert to Image 5. Open the **Toxic Emissions** section by clicking **Add New** to enter the TAC/ODC (i.e. NH_3) and its emission factor information, as shown below. Click **Save** button.



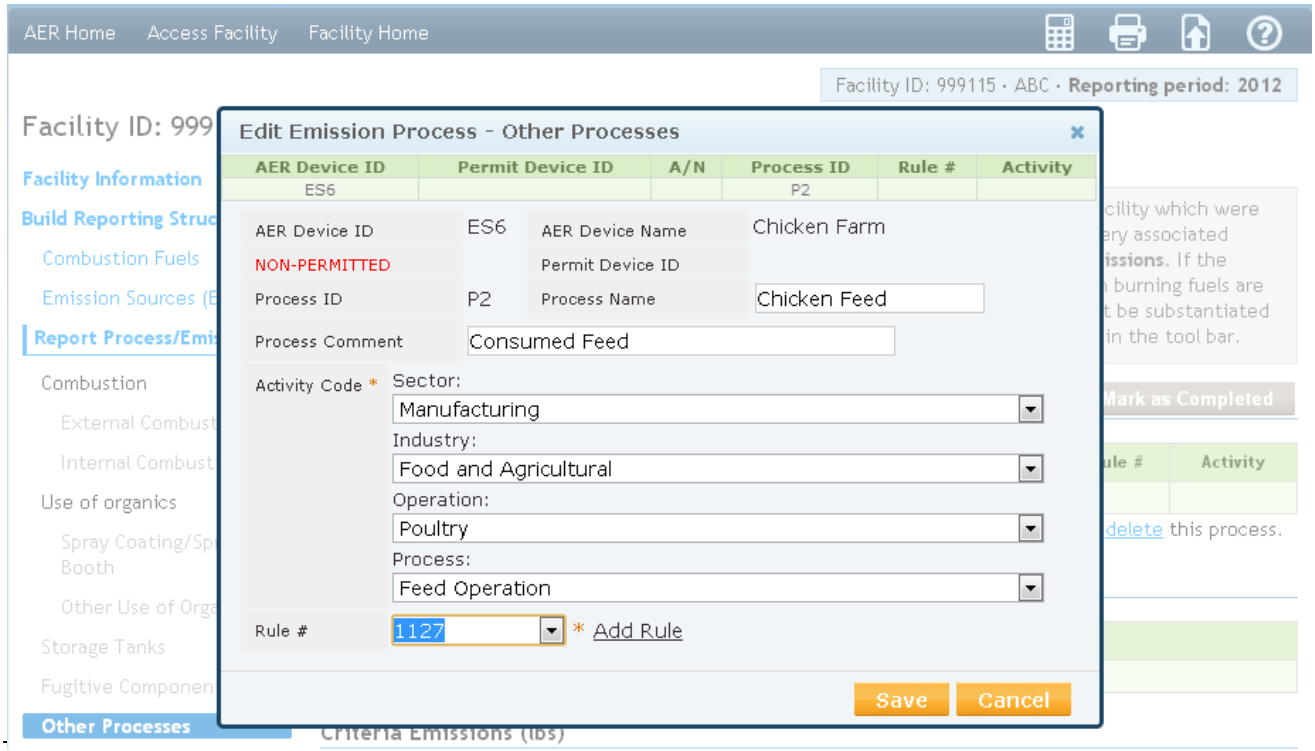
The following images will illustrate the reporting of emissions from handling of chicken feeds. After saved, the program reverts to Image 8 and click **Back to Emission Source Process Reference.**



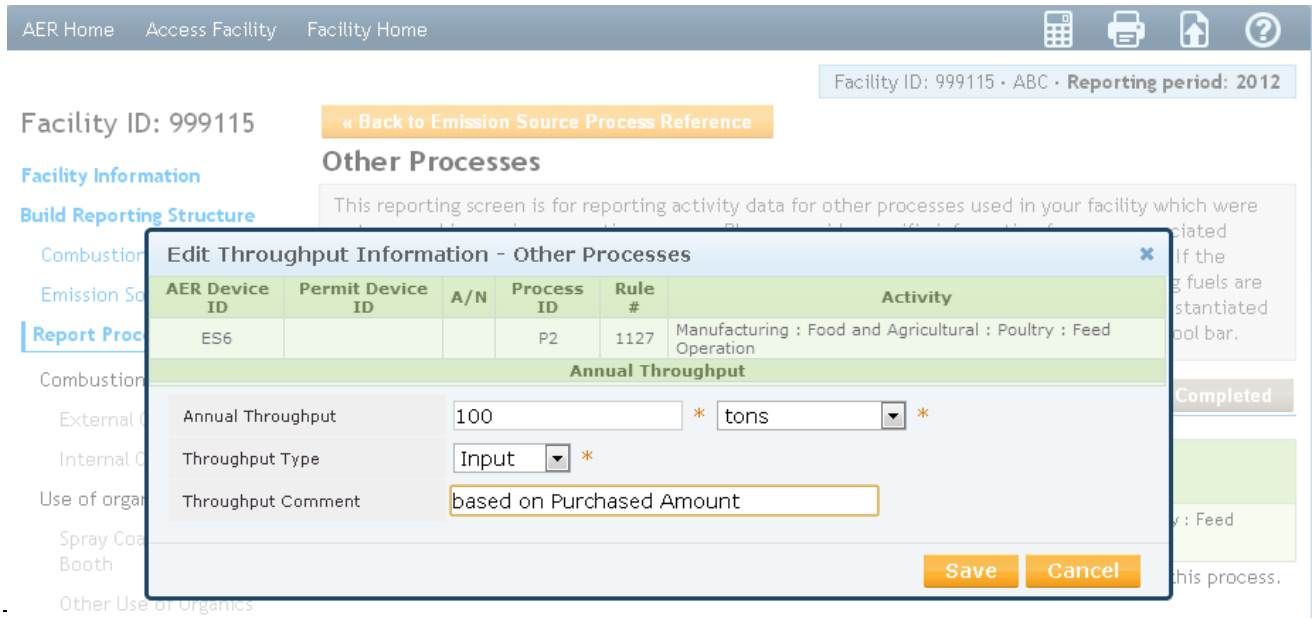
After clicking OK, this image will pop-out. You can start entering the information for Process P2.



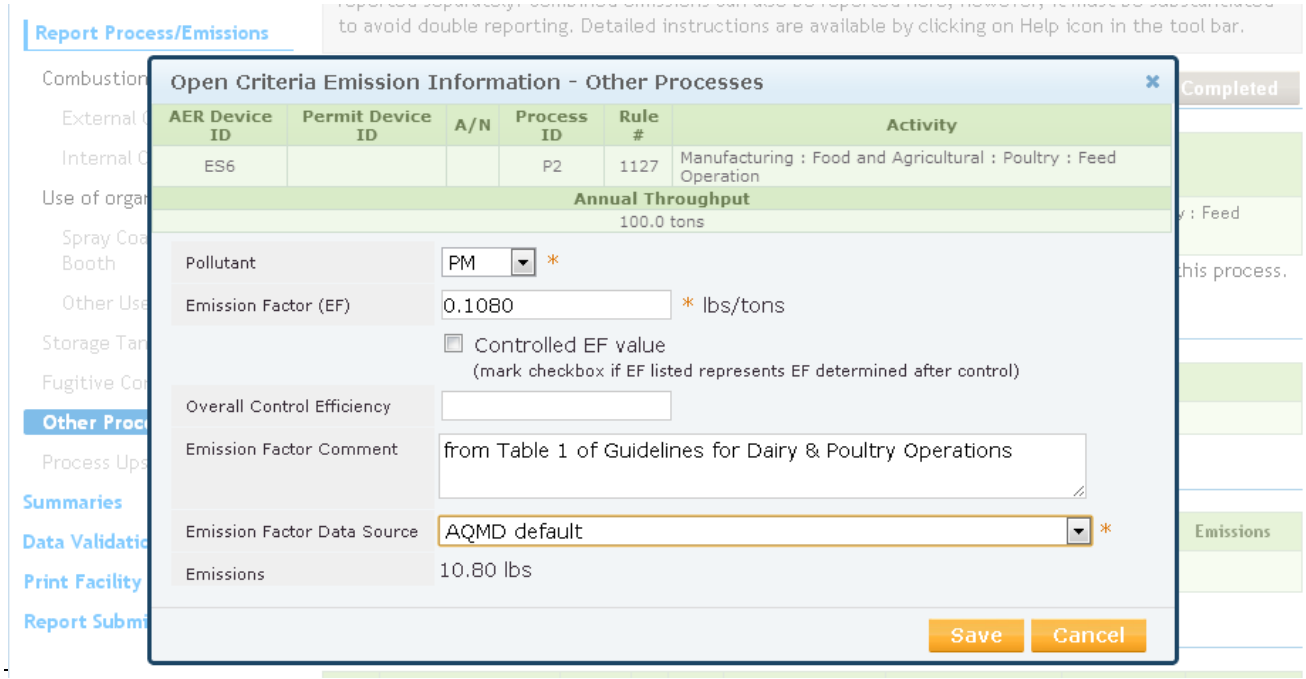
After clicking P2, the following image will pop-out. Identify the Process Name, Activity Code, and select the appropriate Sector, Industry, Operation, Process, and applicable Rule by clicking the Drop-down arrow at the corner of each box. Click **Save** button



After saved, the program reverts to Image 5. Open the **Throughput** section to enter the amount, as shown below. Click **Save** button.



After saved, program will revert to Image 5. Open the **Criteria Emissions** section (by clicking **Add New**) to enter the criteria pollutant (i.e., PM) and its emission factor information, as shown below. Click **Save** button.



After saved, the program reverts to Image 5. Emissions from Process P2 are reported. Complete the report by validating the entries.